Scalping Aids Survival of Longleaf

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Hundreds of thousands of acres have been planted to longleaf pine over the last five years with millions of dollars being spent on artificial regeneration attempts. While many people have been successful planting longleaf pine, many others have endured planting failures.

Most southeastern universities are only now realizing that the tree that once dominated their natural forests has been virtually eliminated from most of their land base. Large timber companies spend millions annually on loblolly and slash pine research, but a mere pittance on longleaf. Observing this disparity, the Longleaf Alliance immediately recognized a tremendous need for information on practical and economical site preparation and herbaceous release for the successful establishment of longleaf pine.

The Longleaf Alliance was founded in 1995. With two unpaid co-directors and a paid staff of one (we only recently added a second fulltime position), research interests were narrowly focused on areas where the Longleaf Alliance could make a difference in regional restoration and retention efforts. Since a large portion of new longleaf plantings occur in old fields and pastures, we directed much of our energy toward finding good methods of successfully establishing longleaf pine on these agricultural sites.

Contrary to popular belief, it is much easier to establish longleaf pine on cutover sites than in fertile old fields recently removed from row cropping or pasture use. Ag sites have particularly aggressive weed species that are usually not prominent on cutover sites. The additional effects of residual herbicides, fungal pathogens, insect pests, drought, and a wide range of pH's, make old agricultural sites some of the most challenging areas imaginable for longleaf restoration efforts.

Key Factors for Success

Whether the site is a cutover or an agricultural site, observations, research, surveys, and practical experience have demonstrated that a few key factors, if properly addressed, will almost always result in successful longleaf pine plantings.

This tractor is scalping an old field site with a three-point hitch scalper.

1. **Apply the proper site preparation prior to planting** through mechanical, chemical, or fire-related means.

2. **Plant early**. Having all your seedlings in the ground before Christmas greatly increases your chances of a successful planting. Good quality container-grown seedlings planted at the Solon Dixon Center in December 2000 had 4 inches of new root growth by mid March 2001. Even if a prolonged drought ensues this summer, these seedlings will probably survive.

3. **Plant good quality seedlings**. Container-grown seedlings improve your chances of success. However, a good quality bareroot seedling is more desirable than a poor quality container grown seedling. Ask around. The nursery should be able to provide references from tree planters, satisfied landowners, and foresters.

4. **Plant the seedlings at the correct depth**. Research conducted by the Longleaf Alliance indicates "deep planting" that covers the terminal bud is severely detrimental to seedling survival and growth.

5. **Control competition through the first growing season**. Late germinants can be particularly problematical in old fields. Agricultural sites may require two herbaceous releases the first growing season.

Which brings us to the subject of this article: "scalping." First of all, what is scalping? In this context scalping is a mechanical means of site preparation. Scalping a field means that the upper layer of soil and/or sod is peeled back. Typically, scalping produces a furrow about 2-3 feet in width and 2-4 inches in depth.

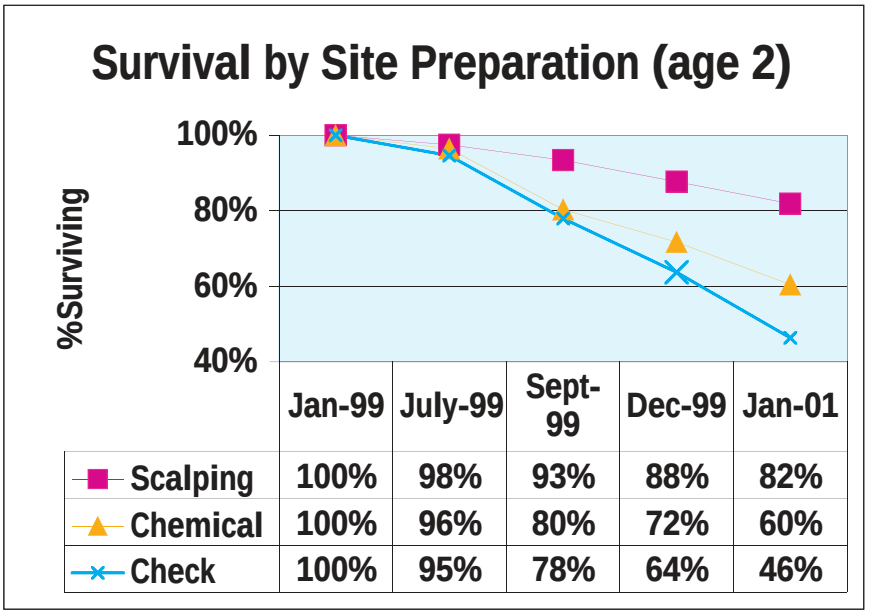
Often, scalpers are modified fire plows. Some companies like R.A. Whitfield Manufacturing of Mableton, Georgia, construct implements specifically for scalping. Additionally, some mechanical tree planting machines have optional blades mounted in front of the planting machine so that scalping and tree planting are done simultaneously.

Why do we scalp? The objectives of scalping are many, and there are positive and negative aspects of this practice.

The Benefits of Scalping

Researchers with the Florida Division of Forestry and the USDA-Forest Service examined the effects of scalping in the 1990s. They conducted studies with both slash pine and longleaf pine on agricultural sites in five counties in Florida. Their studies conclusively demonstrated that both longleaf pine and slash pine survived at greater rates and grew faster when they were planted on land that had been scalped prior to planting. Scalping outperformed Benomyl root dips, herbaceous release, a disking site preparation, and insecticide applications.

Figure 1



Dr. Barnard and others with the Florida Division of Forestry concluded that scalping is extremely beneficial to newly planted pines. They cited the following benefits of scalping:

- Reduced weed competition
- Improved moisture relations
- Reduced pressure form certain root pathogens
- Reduced insect damage
- Possibly improved planting efficacy

First and foremost, we believe scalping helps control competition during the first growing season. A scalping site preparation is extremely beneficial for any seedling planted in perennial grasses. Some of the most competitive perennial grasses are Bermuda grass, bahia grass, fescue, and Johnson grass. Rhizomes and root systems from these species are severely reduced or eliminated in the scalping furrow. This allows seedlings to be planted directly into the mineral soil. Seedlings planted in the scalping furrow also have a greater window of competition-free growth if the grasses were not killed by chemical means prior to planting.

The photo on the left shows container grown seedlings that were hand planted after a scalping site prep. The seedlings are 2 1/2 years old. The photo on the right shows the same age seedlings planted following a chemical site prep.

This pasture site was scalped, ripped and planted with the contour. The seedlings are 5 months old.

In recent years, many landowners have planted longleaf on agricultural sites. A typical scenario on these sites unfolds as follows:

1. The site is relatively clean at the time of planting having just come out of peanut, cotton, or corn production.
2. The landowner applies a herbaceous release the spring following planting, usually with Velpar, Oust, Arsenal or some combination thereof.
3. Six to eight weeks later (depending on rainfall and temperatures) a new crop of annual weeds emerges.
4. The seedlings disappear under a green blanket.
5. The seedlings die.

Many people fail to see the benefits of scalping a site that was in row-crop production the year prior to planting. However, we have found that scalping reduces competition even in fields that do not have significant components of perennial grasses. Whether you realize it or not, there is a time bomb lying in these old fields. In this case, the time bomb is the seed-bank of late germinant grasses and broadleaves.

Through scalping, we peel back the upper layer of soil where a large portion of the annual weed seed bank resides. By removing this seed bank, we greatly reduce the number of weeds that will

Continued on page 26

Scalping

Continued from page 25

germinate in the area immediately surrounding the newly planted seedling. By reducing late germinant competition, a single herbaceous release will frequently afford season-long weed control.

To be successful in these old fields and pastures, new seedlings require one season of good competition control. Scalping combined with the proper herbaceous release will usually yield this result.

Comparing Site Preparations

The Longleaf Alliance installed a study in 1998 to compare scalping, broadcast chemical, and no site preparation methods. We also applied 11 different herbaceous releases over these three site preparations to see if there were specific combinations of site preparation and herbaceous releases that would yield good survival and growth of planted longleaf pine seedlings.

This study was installed near the small community of Dixie in Lower Alabama. The study site was an old pecan orchard that was leveled by Hurricane Opal in 1995. Subsequently, the study site was logged, piled, and burned in 1996 and 1997. The site has typical sandy loam or loamy sand coastal plains soils.

The three methods of site preparation were:

1. **Chemical Site Preparation**. The chemical site prep plots were sprayed with 3 quarts of Roundup Ultra® and 6 ounces of Arsenal® on November 14th, 1998. At planting time (Jan. 12) the chemically treated plots were uniformly brown with little or no live herbaceous growth remaining. These plots were ripped/sub-soiled in December.

2. **Scalping Site Preparation**. Plots so designated were scalped in early December 1998. Following scalping, all plots were sub-soiled.

3. **Check (no site prep)** Plots. These plots were sub-soiled only.

All plots were hand planted on January 11, 1999. Seedlings were grown in containers 6 inches in depth and approximately 6 cubic inches in volume. Seedlings were culled through prior to planting to ensure that only good quality seedlings were utilized in this study.

Table 2

Seedlings Starting Height Growth at Age 2
Planting Density 500 Trees per Acre

Herbaceous Release	Scalping Site Prep	Chemical Site Prep	No Site Prep
Check	187	25	12
Velpar DF (10.67) & Oust (2)	325	212	125
Oust (2)	362	200	81
Arsenal (4) Oust (2) pre-emergent	356	187	50
Arsenal (4) Oust (2) post-emergent	293	231	93
Atrazine (64)	350	94	87
Atrazine (64) & Oust (2)	244	237	75
Oust (2 pre) & Arsenal (4 oz post)	381	169	156
Fusilade 24 oz in April & May	150	144	12
Velpar DF (21.34 oz) = 1lb AI	300	150	50
Velpar DF (10.67 oz) = 1/2 lb AI	319	175	50
Average of all 11 treatments	297	166	72

Eleven different herbaceous release treatments were applied on top of the different site preparations. Pre-emergent/early emergent herbaceous releases were sprayed on 4/7/99. Tank-mixes were applied in a 6-inch band. Post-emergent applications were made on 5/12/99 with the same equipment.

How did the seedlings respond to the different site preparations and herbaceous releases? One treatment stood out at age one: the scalping site preparation. By age two, differences in survival had dramatically widened between the various site preparations. Figure 1 illustrates seedling survival at age two with the various site preparations.

Some combinations of site preparation and herbaceous release were exceptionally effective. In this study, seedlings planted on scalped plots and released with Oust®, Oust and Velpar®, or Oust and Arsenal® yielded the best survival and growth. For instance, seedlings planted on scalped plots that were released with 2 ounces of Oust in April and 4 ounces of Arsenal in May, averaged 93 percent survival at age 2 with 82 percent of surviving seedlings initiating height growth.

Regardless of the herbaceous release applied, seedlings performed best on plots that were scalped prior to planting.

For comparison, the Table 2 shows how many seedlings would be starting height growth at age 2, based upon a planting density of 500 trees/per/acre and the seedling responses observed in this study.

In simple terms, roughly twice as many seedlings started height growth at age 2 on plots that were scalped compared to chemical site preparation plots. Depending on which herbaceous release was utilized, it is possible to have four times as many seedlings initiating height growth at age 2 following scalping, compared to areas that were not site prepared.

In certain circumstances, it is still wise to do a chemical site preparation. Anywhere Bermuda grass is present or the goal is to convert a pasture site back to native vegetation, it is still strongly recommended that the site be chemically site prepared prior to planting. Don't stop with the chemical site prep! It is well worth a few extra dollars to follow a chemical site preparation with scalping. No other treatment is as effective before or after planting your tree seedlings.

Planting longleaf pine at the correct depth is extremely important on scalped sites. The Longleaf Alliance recommends that longleaf seedlings be planted approximately 1/2-1 inch shallower in scalped rows. It is preferable to have the terminal bud at least 1/2-1 inch above the soil surface at the time of planting. In some cases, this means the plug will be exposed at the time of planting. The photo on the left shows the results of planting too deep; the seedling on the right was planted at the correct depth.

The Negatives of Scalping

As with all forestry practices, there are potential negatives to scalping. The major negative associated with scalping is the potential for increased erosion. It is critical that scalping, ripping/sub-soiling, and mechanical tree planting follow the contour of the land. Otherwise, there will be an unacceptable amount of erosion.

There is a strong likelihood that seedlings planted in scalped rows will end up exposed or buried if any of the following happens:

- The scalping site preparation is too deep.
- The scalped rows do not have time to settle prior to planting.
- Scalping is not done with the contour of the land.
- Seedlings are planted at the usual planting depth in the scalped rows.

For best results, scalp and rip the site several months prior to planting. The more rainfall prior to planting the more the site will settle out, and therefore less erosion will take place after planting.

Never plant directly in the rip. Instead, plant a few inches to the side of the rip on the "shoulder" of the scalped row. Mechanical tree planting is a viable option on some sites, especially with bareroot seedlings. However, we have had better luck hand-planting container-grown seedlings on our sites.

Plant shallow! One of the leading causes of longleaf planting failures is deep planting. If the terminal bud is covered the spring following planting, the seedling will probably die. Deep planted seedlings that do survive languish in the grass stage for years and years while surrounding seedlings planted at the correct depth put on three feet or more height growth a year.

On most sites, soil moves away from newly planted tree seedlings. In scalped rows, the soil moves onto the seedling. For this reason, it is recommended that longleaf seedlings be planted approximately 1/2-1 inch shallower in scalped rows. It is preferable to have the terminal bud at least 1/2-1 inch above the soil surface at the time of planting. In some cases, this means the plug will be exposed at the time of planting. In another study conducted by the Longleaf Alliance, seedlings planted with the plug 1/2-inch above the soil surface in scalped rows survived and grew better than those planted with the plug covered. The consequences of planting too deep far outweigh the perceived negatives of shallow planting.

An ideally planted seedling will have the plug slightly covered, and the terminal bud exposed the spring following planting. If the terminal bud is covered, the seedling is too deep. With most sites, you may want to consider planting the seedlings with the plug at or slightly above (1/4-1/2 inch) the soil surface.

Recap

We recommend a scalping site preparation when attempting to establish any tree species on agricultural sites, whether the site was in pasture or cultivation, the only exception being sites with excessive slope where erosion is likely.

Ensure that scalping is done with the contour and scalp several months prior to planting. Scalp as shallow as possible. On cultivated fields, 2-3 inches in depth should be sufficient. Where a sod is present, it may be necessary to scalp 4-5 inches deep to remove the rhizomes and root systems of perennial grasses.

Plant longleaf seedlings shallow in scalped rows. Never plant directly in a ripped furrow. It is usually advantageous to plant on the shoulder of the scalped row rather than in the lowest point where flowing water may uncover or bury newly planted seedlings. Other tree seedlings may be planted at their normal depth in scalped rows. Follow up with a herbaceous release. For the results of two herbicide screening trials and comparisons of different site preparation methods, contact the Longleaf Alliance at 334-222-7779; email: LLA@alaweb.com.